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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,505	06/30/2003	Pan Ki Kwon	30205/39439	1321
4743	7590	01/06/2006	EXAMINER	
MARSHALL, GERSTEIN & BORUN LLP 233 S. WACKER DRIVE, SUITE 6300 SEARS TOWER CHICAGO, IL 60606			VINH, LAN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 01/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/609,505

Applicant(s)

KWON ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-9 and 11-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-9, 11-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 10/605,505.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/10/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/18/2005 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 3-9, 11-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 12 recite the limitation "the resultant structure". There is insufficient antecedent basis for this limitation in the claims. Claims 3-9, 11, 13-20 are indefinite because they depend on 1 and 12

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 1765

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 6, 9, 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959)

Lee discloses a method for manufacturing a contact in a semiconductor device, the method comprising:

forming a wordline pattern having a sequentially stacked structure of a wordline conductive material 103 and a hard mask nitride film 104 on a semiconductor substrate (col 6, lines 11-13; fig. 3D)

forming a spacer 112 on a side of the wordline pattern (col 6, lines 58-60)

forming a planarized interlayer insulating film 114 covering the wordline structure (col 6, lines 66-67)

etching the interlayer insulating film until the substrate is exposed, to form a contact hole (col 7, lines 21-27)

forming a doped polysilicon layer on the entire surface of the wordline structure filling the contact hole (col 7, lines 54-56)

Art Unit: 1765

performing a chemical mechanical polishing (CMP) process on the polysilicon layer and the interlayer insulating film to expose the hard mask layer 104 using a CMP slurry on the polysilicon layer and insulating layer 114, the removing/etching ratio between polysilicon and interlayer insulating film 114 substantially same (col 7, lines 57-62; fig. 3H)

Unlike the instant claimed invention as per claim 1, Lee fails to specifically disclose polishing the polysilicon and insulating layer using an acidic oxide CMP slurry having a pH ranging from 2-7 and an oxidizer such as hydrogen peroxide

Clevenger discloses a method for polishing a polysilicon layer 70 formed on an insulating film using an acidic slurry having silica, an oxidizer such as hydrogen peroxide, the slurry having a pH of 7 (col 4, paragraph 0041; paragraph 0043)

Since Lee is concerned with a step of CMP a polysilicon/conductive layer (col 7, lines 58-60), one skilled in the art at the time the invention was made would have found it obvious to modify Lee polishing step by using an acidic CMP slurry for oxide to remove the excessive metal/conductive material as taught by Clevenger (col 4, paragraph 0043)

The limitation of claim 9 has been discussed above

Regarding claim 11, Lee discloses that the layer 114 comprises of HDP oxide (col 6, lines 66-67; col 7, lines 1-3)

5. Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959) and further in view of Small et al (US 6,635,186)

Art Unit: 1765

Lee as modified by Clevenger has been described above. Unlike the instant claimed inventions as per claims 3-4, Lee and Clevenger do not specifically disclose using 1-40%/20-30 vol % of the oxidizer based on the CMP slurry

Small discloses a method for polishing comprises the step of using 30 % of the H₂O₂/oxidizer based on the CMP slurry (col 21, lines 44-45)

Thus, one skilled in the art at the time the invention was made would have found it obvious to modify Lee and Clevenger by using 30 vol % of the oxidizer based on the CMP slurry as per Small because according to Small, the slurry contains 30 vol % of the oxidizer polishes better than the traditional hydrogen peroxide chemistry for copper/conductive CMP (col 21, lines 48-59)

6. Claims 5, 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959) and further in view of Tsuchiya et al (US 6,585,568)

Lee as modified by Clevenger has been described above. Unlike the instant claimed inventions as per claims 5, 7-8, Lee and Clevenger do not specifically disclose using the acidic slurry having a pH from 2-5 and 25-35 wt% of the abrasive

Tsuchiya discloses a method for polishing using a CMP slurry contains acid, 1-50% abrasive and a pH ranging from 3 or more (col 5, lines 12-63; col 6, lines 24-26)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lee and Clevenger by using a slurry contains 1-50% abrasive and a pH ranging from 3 or more as per Tsuchiya because Tsuchiya discloses that a content

Art Unit: 1765

of a polishing material/abrasive in a polishing slurry may be appropriated selected within the range of 0.1-50 % to the total amount of the slurry (col 5, lines 25-27)

7. Claims 12-13, 15, 18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959) and further in view of Small et al (US 6,635,186)

Lee discloses a method for manufacturing a contact in a semiconductor device, the method comprising:

forming a wordline pattern having a sequentially stacked structure of a wordline conductive material 103 and a hard mask nitride film 104 on a semiconductor substrate (col 6, lines 11-13; fig. 3D)

forming a spacer 112 on a side of the wordline pattern (col 6, lines 58-60)

forming a planarized interlayer insulating film 114 covering the wordline structure (col 6, lines 66-67)

selectively etching the interlayer insulating film in a partial region until the substrate is exposed, to form a contact hole (col 7, lines 21-27; fig. 3G)

forming a doped polysilicon layer on the entire surface of the wordline structure filling the contact hole (col 7, lines 54-56)

performing a chemical mechanical polishing (CMP) process on the polysilicon layer and the interlayer insulating film to expose the wordline structure using a CMP slurry on the polysilicon layer and insulating layer 114, the removing/etching ratio

Art Unit: 1765

between polysilicon and interlayer insulating film 114 substantially same (col 7, lines 57-62; fig. 3H)

Unlike the instant claimed invention as per claim 12, Lee fails to specifically disclose polishing the polysilicon and insulating layer using a CMP slurry having a pH ranging from 2-7 and an oxidizer such as hydrogen peroxide

Clevenger discloses a method for polishing a polysilicon layer 70 formed on an insulating film using an acidic slurry having silica, an oxidizer such as hydrogen peroxide, the slurry having a pH of 7 (col 4, paragraph 0041; paragraph 0043)

Since Lee is concerned with a step of CMP a polysilicon/conductive layer (col 7, lines 58-60), one skilled in the art at the time the invention was made would have found it obvious to modify Lee polishing step by using an acidic CMP slurry for oxide to remove the excessive metal/conductive material as taught by Clevenger (col 4, paragraph 0043)

Lee and Clevenger also do not specifically disclose using 1-40%/20-30 vol % of the oxidizer based on the CMP slurry

Small discloses a method for polishing comprises the step of using 30 % of the H₂O₂/oxidizer based on the CMP slurry (col 21, lines 44-45)

Thus, one skilled in the art at the time the invention was made would have found it obvious to modify Lee and Clevenger by using 30 vol % of the oxidizer based on the CMP slurry as per Small because according to Small, the slurry contains 30 vol % of the oxidizer polishes better than the traditional hydrogen peroxide chemistry for copper/conductive CMP (col 21, lines 48-59)

The limitation of claim 18 has been discussed above

Art Unit: 1765

Regarding claim 20, Lee discloses that the layer 114 comprises of HDP oxide (col 6, lines 66-67; col 7, lines 1-3)

8. Claims 14, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959) and Small et al (US 6,635,186) and further in view of Tsuchiya et al (US 6,585,568)

Lee as modified by Clevenger and Samll has been described above. Unlike the instant claimed inventions as per claim 14, 16-17, Lee, Clevenger and Small do not specifically disclose using the acidic slurry having a pH from 2-5 and 25-35 wt% of the abrasive

Tsuchiya discloses a method for polishing using a CMP slurry contains acid, 1-50% abrasive and a pH ranging from 3 or more (col 5, lines 12-63; col 6, lines 24-26)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lee, Clevenger and Small by using a slurry contains 1-50% abrasive and a pH ranging from 3 or more as per Tsuchiya because Tsuchiya discloses that a content of a polishing material/abrasive in a polishing slurry may be appropriated selected within the range of 0.1-50 % to the total amount of the slurry (col 5, lines 25-27)

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US 6,607,955) in view of Clevenger et al (US 2002/0048959) and Small et al (US 6,635,186) and further in view of Liu et al (US 6,635,576)

Art Unit: 1765

Lee as modified by Clevenger and Samll has been described above. Unlike the instant claimed invention as per claim 19, Lee, Clevenger and Small do not specifically disclose using SiON material in the wordline structure

Liu discloses a method for fabricating a semiconductor device comprises the step of using SiON material in the wordline structure (col 8, lines 26-28)

Hence, one skilled in the art at the time the invention was made would have found it obvious to modify Lee, Clevenger and Small method by using SiON material in the wordline structure as per Liu because Liu discloses that SiON provides graded-stair etch concept that is important to the invention (col 8, lines 28-30)

Response to Arguments

10. Applicant argument which stating that Tsuchiya does not suggest an idea of applying the acidic slurry onto the combination of the polysilicon layer and the oxide film have been considered but are moot in view of the new ground(s) of rejection based on the Clevenger reference that discloses using applying the acidic slurry onto the combination of the polysilicon layer and an insulating film

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

Art Unit: 1765

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV

January 2 , 2006